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IMPROVEMENT OF ACCURACY IN BATIK I MAGE CLASSIFICATION DUE TO SCALE AND ROTATION CHANGES USING M2ECS-LBP ALGORITHM

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ABSTRACT

This research evolves feature extraction algorithms in overcoming difficulties in classifying batik images that encounter changes in scale and rotation. the algorithm is multiscale and multilevel extended center symmetric local binary pattern (M2ECS-LBP). In utilizing this algorithm using several types of windows to obtain optimal feature extraction results, ranging from the size of 6x6, 9x9, 12 x 12 and 15x15 or a combination of several windows. However, for the use of algorithm carried out sequentially, it also requires a special strategy to obtain optimal image feature extraction results to support performance accuracy in the classification. The results of classification accuracy using K-Nearest neighborhood had reached up until the percentage to 78,4 – 81.7 percent of the image undergoing changes in scale and rotation. However, if the batik image undergoes a change in scale but the rotation is the same then the accuracy percentage can reach 98-99 percent. This algorithm is a very powerful breakthrough with lighter computing techniques than other algorithms. This research can be continued to recognize moving images, expected with maximum accuracy.

Keywords: *Scale, Rotation, Classification, Batik, Multiscale And Multilevel, Similarity Measurement*

1. INTRODUCTION

Actually Batik cloth is one of the intellectual property and culture owned by Indonesia that must be preserved and protected so that it is not approved by other nations [1]. Batik cloth can be grouped based on the similarity of the patterns and then a pattern recognition process can be carried out. Batik needs to be recorded and collected because it is one of the intellectual and cultural properties of Indonesia. This was recognized by UNESCO in 2009. Batik in Indonesia has many types according to their respective regions [2][3]. So it is expected that the introduction of this pattern will be able to help in providing information to ordinary people about the type of batik [3]. In its development until now batik is known and widely used by various group and that is mandatory once a week for all employees to wear batik uniforms.

Basically, attention to batik patterns is very necessary in order to prevent being admitted by other nations. Because in the absence of good information or documentation about the pattern of Batik [4][6]. It will be recognized by other nations. With so many different patterns of batik have been coming from different regions and be taken through several different sources, it will be difficult recognize manually [2][5]. Because this problems need to be done recording or inventory of all patterns of batik, which became the hallmark of Indonesian [1][4].

Based on the results of the study that it requires an appropriate and effective solution in dealing with changes in image feature both texture and shape but undergo to changes in scale and rotation [12]. Several studies have been carried out by researchers, but have not shown optimal results especially if the image undergoes several changes to it, we propose the M2ECS LBP algorithm as a new model for feature extraction processes.

This algorithm has a very remarkable ability to perform feature extraction processes so that it can produce a percentage of accuracy in classification more optimally. This algorithm is very suitable for detecting and recognizing normal images that undergo changes in scale and rotation. But if the image that shifts to the initial position will be studied in the next study

In addition, in carrying out the M2ECS-LBP algorithm it has advantages such as computational time is faster and more effective than LBP or other methods. Basically, this algorithm uses several windows (maximum 4 windows) while the

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frequency value starts from 0 .. 15 (1 window) to 0.. 64 (4 windows x 16). Although this algorithm uses 4 windows or less, it is a great strategy in producing feature extraction that can support classification accuracy and this is evidenced by the experimental results for images undergoing scale and rotation changes resulting in a percentage of more than 81 percent. Even if the batik image experiences the same scale and rotation changes, the classification accuracy can reach more than 99 percent. This is an improvement from several previous studies which only focused on rotation or scale.

Although the M2ECS-LBP algorithm must be compared with other algorithms that have a more sophisticated computational process, it cannot produce feature extraction that is good enough, so it cannot support the classification of images that undergo changes in rotation and scale simultaneously. Some examples of batik images studied as follows in figure 1.0

Figure 1: Collection of pattern batik from diffrent area In Indonesia

2. RELATED STUDY

Several other studies with approach to retrieval Batik image with more flexible with Generalized Hough Transform. This method is to recognize the appearance of multiple motives in the same set of images (classification) [8]. In this research using log-Gabor filter and histogram color characteristic, in designing some research applied to the collection of Batik [10]. Other research proposed a method of rotated wavelet filter and wavelet transform in conducting research on certain Batik motifs as well as for similarity measurements using the Canberra Distance. In the classification of the image Batik using multilayer perceptron [5][6].

The other study used the SIFT characteristic extraction method in recognizing batik patterns and incorporating the Hough transform algorithm to deal with unsuitable keys resulting from symmetrical and repetitive patterns [12]. This study examined the performance of the selection and reduction features in batik that the retrieval process for it was used in this research experiment was a combination of four features of extraction methods, Gabor filters, log-Gabor filters, GLCM, and LBP [13]. Developing of machine learning by generating new models for classification by developing Fuzzy Neural network and Backtracking algorithms through utilizing 7 statistical parameters and 5 categories [7]. Beside illustrates of study that one of the extraction methods of the exact texture feature is Local Binary Pattern. Several studies have been proposed to improve LBP performance, such as Completed Local Binary Complete (CRLBP) [11]. However, CRLBP is not invariant to rotation, so in this study new approach method is proposed called Improved Completed Robust Local Binary Pattern (ICRLBP) [23]. This study describes a new method for characteristic extraction of batik images is called enhanced microstructure descriptor (EMSD). EMSD is an enhancement model of the micro-structure descriptor (MSD) which Guang-Hai Liu proposes [14].

2.1 Local Binary Pattern

LBP can be defined as the comparison of pixel binary values in the center of the image with 8 neighboring pixel values around it. For example in a 3x3 image, the binary value in the image center is compared with the neighboring value of the surroundings[17][18]. By comparing the pixel value in the center of the image with the neighboring pixel value, if the result is more or equal then it is given a value of 1 and if the result is less then it is given a value of 0. After that, arrange 8 binary values clockwise and change the 8 bit binary into the decimal value to replace the pixel value in the center of the image. Basically LBP is a simple method, but efficiently represents the characteristic of texture [21]. The LBP operator consists of only a few neighboring pixels with an uncomplicated counting operation. In addition, LBP is a gray-scale invariant method, or unaffected by uneven lighting, because LBP describes textures locally[18]. The extraction algorithm with LBP has 2 steps:

1. Thresholding step and
2. Encoding step.

In the thresholding step, all neighboring pixel values in each pattern will be comparable to the existing centered value between their pattern values, this is to convert their values to binary values (0 and 1). For value 0 which has a smaller value with a central value while the value of 1 for a number greater than its central value. This step is to help in getting information about the difference of local binary on each part. Then in the encoding step, a number of binary values obtained from the

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thresholding step would be converted into decimal numbers for the characteristics of the pattern structure. all processes can refer to Figure 2.

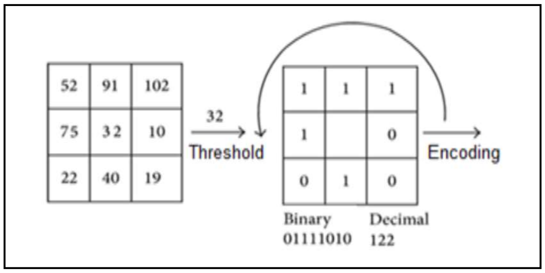

Figure 2 : Threshold and Encoding Process as basic in Local Binary Pattern

2.2 Center Symmetric Local Binary Pattern

Generally LBP operators yield a long histogram and generate it difficult to describe the image area. It was developed into Centre-Symmetric Local Binary Patterns (CS-LBP) in the description of image areas. CS-LBP aims for a smaller number of bin compared to the LBP algorithm, as well as in yield shorter histogramm, which are more suitable for the description of the feature area. In addition CS-LBP is designed to have higher stability for flat image area. [15]. Therefore, a method to solve the problem is developed by modifying the scheme for comparison between pixels in its neighbours. By comparing the pixel-symmetric centre pairs can refer to figure 3. In general CS-LBP is a modification of LBP and able to be called the ekspansion of LBP [19][20].

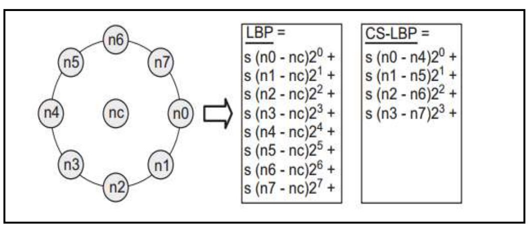

Figure 3 : Comparation schema between LBP and Center Symmetric Local Binary Pattern (CS-LBP)

Some of the advantages utilized the centre symmetric LBP are to generate shorter histogram values and to describe the local area simplify . This can be seen in Figure 3 with 8 neighbourhood, LBP generate 256 (28) differences from the binary pattern, but for CS-LBP this number is only 16 (24) Furthermore, reliability in the flat image area will be obtained by different threshold gravyscale values [15][19][20].

$$CS\text{-}LBP_{R,N,T}(x,y) = \sum_{i=0}^{(N/2)-1} s(n_i - n_{i+(N/2)})2^i,$$
$$s(x) = \begin{cases} 1, & x > T, \\ 0, & \text{otherwise} \end{cases} \quad (1)$$

For the CS-LBP operator it has three parameters: radius R, the number of pixel N addresses, the threshold value at the grayscale difference T. In the research that has been carried out it shows good values for some parameters [consisting of {1,2} for R, {6 , 8} for N and {0 ... 0,02} for T [19].

2.3 Multiscale Block Local Binary Pattern algorithm (MBLBP)

Basically MBLBP takes a characteristic structure on a broader scale which can be a dominant feature of image structure. Because multi-scale encoding does not only cover the pattern structure which is micro but also macro. In MBLBP the comparison between single LBP pixels is replaced by the mean value of sub-regions. Sub-regions are the average results of a single square pixel. LBP defines each image pixel and uses 3x3 neighbouring pixel values with central pixels as thresholding values. The single pixel value of MBLBP will be replaced by the average pixel value of the sub-regions blocks. The weighted MBLBP is obtained by comparing the value of the central pixel sub region (gc) with the neighbouring sub-regions (g0 .. g8). The resulting weighting is linear weighting. The Image description of the Multiscale block LBP formula can be seen in below:

$$MB-LBP = \sum_{i=0}^{7} s(g_i - g_c)2^i \quad s(x) = \begin{cases} 1, if\ x \geq 0 \\ 0, if\ x < 0 \end{cases} \quad (2)$$

For gc is the average value of the center pixel of the sub-region block, gi (i = 0 ..8) is the neighboring sub-region and s is the sign (binary code). gc = center value. For the MBLBP value that is generated is to multiply the pixel value that has gone through the thresholding and binary weighting processes in accordance with the position of the pixel. The MBLBP process can refer to figure 4.

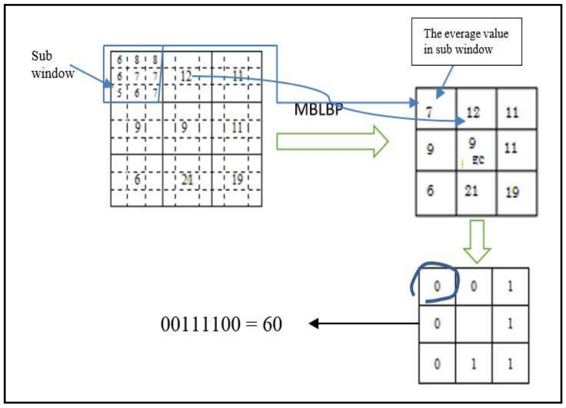

Figure 4 : The process of multiscale block Local Binary Pattern algorithm

The advantages of multiscale block local binary pattern (MB-LBP) are:

1. MB-LBP is designed to overcome the deficiencies of local binary Patterns especially on multi-scale images.
2. MBLBP can acquire on a wider scale structure that may be the dominant feature of the structure of an image.
3. Because of the multi scale, in coding it is not only used in the micro pattern structure but also in the macro. [24][25]

2.4 Extended Center Symmetric Local Binary Pattern algorithm

In this study capturing the development of the center symmetric local binary pattern algorithm, by comparing the value of gray on each symmetric pixel center pair, resulting in a shorter histogram. This algorithm is called extended Center Symmetric LBP. Actually this algorithm is very suitable for flat images and is dominant in micro-characteristic structures, including this can increase the speed in determining the frequency values described in the form of histograms. In addition, this method is robust against noise and produces a shorter histogram compared to the LBP method, without ignoring the local characteristics of the image pattern structure. [26]. This can be expressed by the formula below :

$$XCS\_LBP_{PR}(c) = \sum_{i=0}^{(P/2)-1} s(g_1(i,c) + g_2(i,c))2^i \quad (3)$$

As for the function of the s value as follows:

- ➢ For p = number of neighboring pixels
- ➢ Meanwhile for $g_1(i,c)$ and $g_2(i,c)$ can be described by the formula below :
- ➢ $g_{1(i,c)} = g_i - g_{i+(p/2)} + g_c$; $g_{2(i,c)} = (g_i - g_c)(g_{i+(p/2)} - g_c)$
- ➢ s = sign to declare the formula.

So that the translation of the formula above is

XCS_LB $_{PR}$(c) =
$s((g_0-g_4)+g_c+(g_o-g_c)(g_4-g_c))2^0+$
$s((g_1-g_5)+g_c+(g_1-g_c)(g_5-g_c))2^1+$
$s((g_2-g_6)+g_c+(g_2-g_c)(g_6-g_c))2^2+$
$s((g_3-g_7)+g_c+(g_3-g_c)(g_7-g_c))2^3$

- ➢ g_x = grayscale value; g_c = center value

The formula of Extended Center Symmetric Local Binary Pattern algorithm can refer to figure 5.

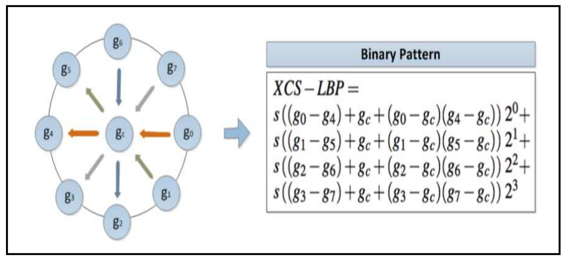

Figure 5 : Extended Center Symmetric Local Binary Pattern.

To calculate the frequency value of the calculation results with the symmetric local binary pattern extended center method, formula (4) is used:

tem p (e) = temp (e) + 1 (4)

- ➢ Var temp = array which is used to collect values from variables e
- ➢ Var e = A variable that collect the value of the XCS_LBP algorithm

Some reasons in this research by using extended center symmetric local binary pattern That is

1. The proposed XCS-LBP produces a shorter histogram than LBP, as short as CS-LBP, meanwhile it extracts more image details than CS-LBP because it takes into account the gray value of the central pixel, and it relies on a new strategy for neighboring pixels comparison. In the research that has been carried out that this algorithm is more robust than image noise even compared to LBP and CS-LBP [25][26].

2. THE PROPOSED NEW FEATURE EXTRACION ALGORITHM

This research was conducted in order to support the image classification capability of Batik which experienced changes in image rotation and scale together. In supporting the ability to increase classification, it requires a reliable and precise feature extraction algorithm, in recognizing batik images in various sources such as in the Internet, magazines, taking directly on the motif of batik images through digital cameras.

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2.1 Research Schema

Meanwhile the research scheme in developing a Batik image classification that is invariant to rotation and scaling is divided into 5 main stages, starting from :

1. Collection and Selection Image batik
2. Preprocessing (Grayscale)
3. Batik image processing with scale and rotation differences
4. Feature Extraction of left and right image with M2ECS-LBP algorithm.
5. Similarity Measurement for Classification with K-NN

The process stages in the research scheme of batik image classification are in figure 6.0.

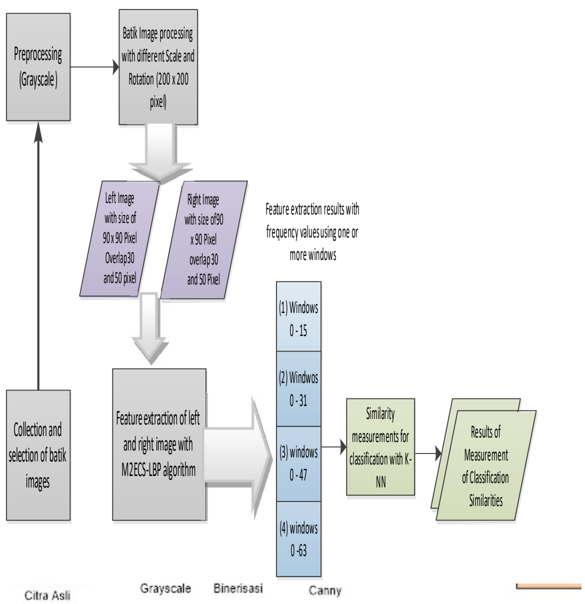

Figure 6 : Research schemes for batik image classification

2.1.1 Collection and Selection of batik Image

In the first stage to be carried out is collection and continued with the selection of batik motifs to be undertaken. There are 3 conditions for choosing a Batik image to be collected, namely:

1. Condition of image and motif of Batik image. For the condition of the Batik image to be studied, it must be clear the characteristics of the shape and characteristics of the texture that is owned, whereas
2. All batik image data that has been collected will be re-selected based on motives, this is done to prevent if there are images that have the same motif.
3. All selected batik image data will be cropped to focus on the motives to be studied and do the resizing process to 200 x 200 pixel image size.

3.1.2 Preprocessing

At this stage several activities are carried out such as selecting batik images that had been collected, changing the size of the image to 200 x 200 pixels and changing the color of the batik image to gray (Grayscale), so that the focus of this research is only on texture and shape and not include color characteristics.

3.1.3 Batik Image Processing with different Scale and Rotation

The stage of the feature image extraction where the initial image with a size of 200 x 200 pixels will be processed to scale with several types, the results of each scale on the characteristic will be rotated in several ways. Each image that has undergone a change in scale and rotation will be divided into 2 parts into the left and right image with a size of 90 x 90 pixels with overlap of 30 and 50 pixels. The process can be seen in figure 8.

3.1.4 Feature Extraction of left and right image with M2ECS-LBP

Feature extraction is process to fetch characteristics of an image that describes the characteristics of an image. By using this new feature extraction model, left and right images with 90 x 90 pixel size will be processed one by one. For the feature extraction process, the left and right image will use several windows to obtain optimal feature extraction results. The type of window would be utilized based on the concept of a multiscale local binary pattern (MB-LBP) method, which the size of windows are 6x6, 9x9, 12x12, and 15x15 or linking from several windows. The results of processing each window or merging several windows will be combined into a frequency value.

3.1.5 Classification of batik Image

An image can be classified into groups that have been determined based on the characteristics of the image visually, namely color, shape and texture. The image classification is very necessary to identify the characteristics of image objects that are owned and categorized into different groups / classes. In general, the purpose of the batik classification is to divide the batik image into classes according to the pattern of the motif so that it is easy to recognize according to its characteristics. The classes in this study will based on the type of batik, in this case there are 12 classes with the total number of images is 80 images. In this study the process of batik image

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classification will utilize the K-Nearest Neighbor method.

3.2 Dataset Preparation

The dataset used consists of 9 types of classes (batik patterns) with a total image of 90 batik images. Every original image will be transformed and the scale consisting of

- ➢ For the scale of the image to be examined are 90, 110, 120,140,150,160 and 180 percent of the original image
- ➢ For image rotations to be examined for each scale are 0, 10, 15, 30, 45.60, 75, 90, 105, 110, 120,135.

A collection of batik images that undergo changes in scale and rotation simultaneously can refer to figure 7.0.

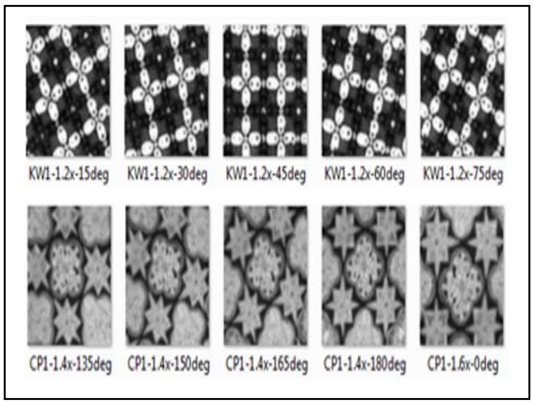

Figure 7 : The Example of batik image which have changed the scale and rotatoion

Figure 7 illustrates a set of database images of batik that have undergone changes in scale and rotation.

3.3 Multiscale and Multilevel Extended Center Symmetric Local Binary Pattern algorithm

This algorithm uses the advantages of a multiscale local binary pattern block that can describe characteristic structures on a wider scale, so that not only in the micro structure but also in the macro structure. For the Extended Center Symmetric Local Binary Pattern (XCS-LBP) method it is very suitable and suitable for data images and dominant in micro-characteristic structures, including this can increase the speed in determining the frequency value, compared to LBP which is described in the form of histograms. Meanwhile in the early stages of the image of batik with a size of 200 x 200 pixels divided into 2 parts, namely:

1. The left side of the image is 90 x 90 pixels with overlapping 30 and 50 pixels
2. The right side of the image is 90 x 90 pixels with overlapping 30 and 50 pixels

All the process can be seen in Figure 8.

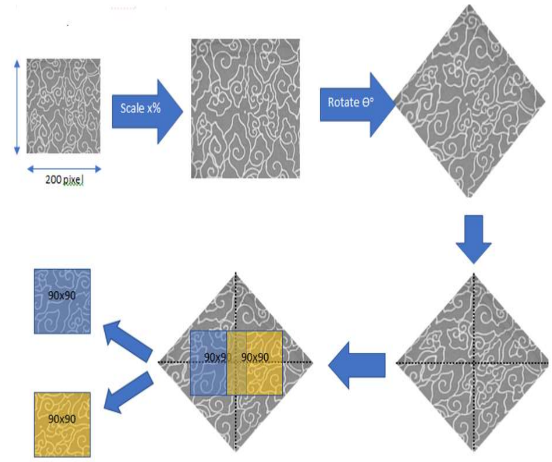

Figure 8 : The stages of dividing the original image into 2 parts and witness in changing of scale and rotation

Figure 8 describes the stages of image processing which are divided into two parts left and right images with a size of 90 x 90 pixels to obtain optimal feature extraction, it will be processed with several windows, namely 6x6, 9x9, 12 x 12 and 15 x 15. Where each window will be processed into 9 sub windows of different size.

Stages of the M2ECS-LBP algorithm can be seen in Figure 9:

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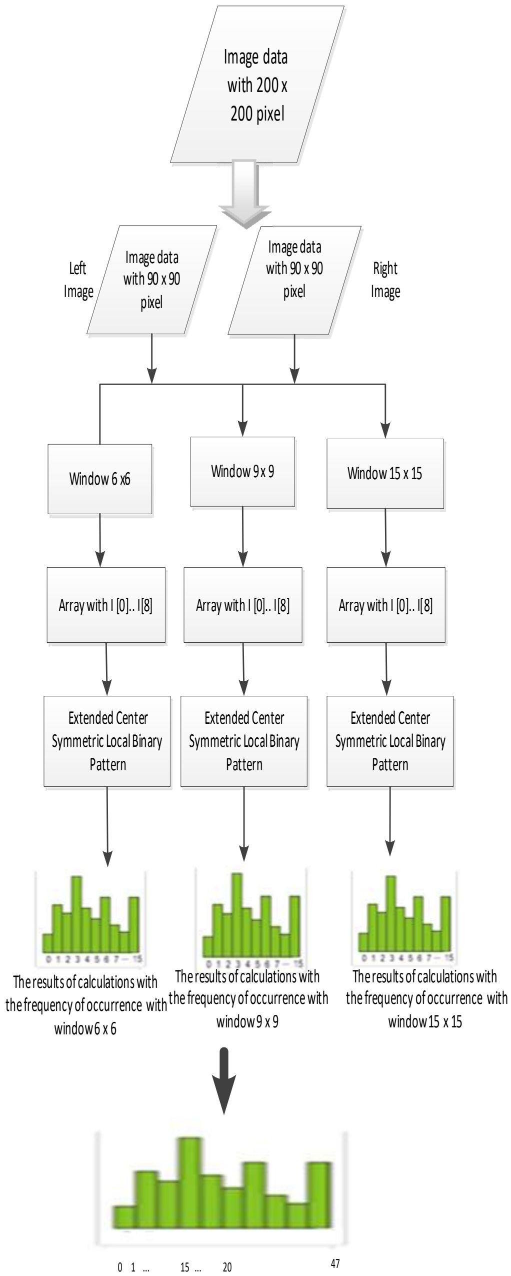

Figure 9 : Mutliscale and Multilevel extended Center Symmetric local binary pattern

The process staes are as follows:

1. Read batik images with a size of 200 x 200 pixels
2. Divide the image into 2 parts with a size of 90 x 90 pixels while overlapping 30 pixels, 40 pixel and 50 pixels.
3. Start of the process for the 90 x 90 pixel left image with 30 pixel overlap as follows:

A. 90 x 90 pixel imagery divided by non-overlapping areas with window 6 x 6

   a. Divide window 6 x 6 into 9 sub windows with the size 2 x 2 non-overlapping. If window 9 x9 than sub windows 3 x 3. If windows 12 x 12 than sub window 4x 4 and if window 15 x15 than sub window 5 x 5.
   b. Determine the average value of each sub window.
   c. Save the average value to the array elements g [0] to g [8].
   d. Get the results of g [0] to g [8] it will be processed by XCS-LBP algorithm, where g [4] is the center.
   e. Save the results on the variable e
   f. Process of accumulates to temp variable.
   g. Shift next step for 1 pixel to the right for 6 x6 windows in the 90 x 90 pixel image region.
   h. Go back to the sequence of process a until it finishes in the last right window.
   i. Process returns to the left and then drops 1 pixel down and starts the process again a
   j. Process will stop until the lower right window

B. Process carried out for the 90 x 90 pixel with 6x6 window, is also continued for next windows such as 9 x 9, 12 x12 and 15 x 15.

C. Process the temp function in each window to produce a histogram.

D. Combine 3 (three) histograms with the concatenating histogram, so that changes in values occur to 0 to 47.

E. Followed by processing the right image 90 x 90 pixels with overlapping 40, 50 pixels and continuing with the stages of the process a. (go to process a).

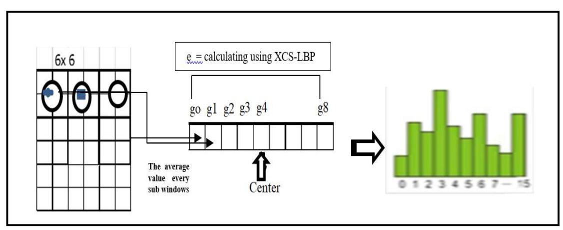

Figure 10: MBLBP process where the average value in the subwindow is entered in a 1-dimensional array

4 EXPERIMENT RESULTS

A. The 1st experiment on the image of batik with a size of 200 x 200 pixels which will be divided into 2 parts, namely the left and right images with a size of 90 x 90 pixels and overlap 30 Pixel.

   a. With the K-Nearest Neighborhood classification method with sizes K = 1, 3 and 5.

b. Number of training data = 180 Image , with condition Degree = [0] and scales= [1].
c. Number of Testing data = 10800 image , with condition :
d. Degree = [15 30 45 60 75 90 105 120 135 150 165 180]
e. Scale = [0.9 1.2 1.4 1.6 1.8]

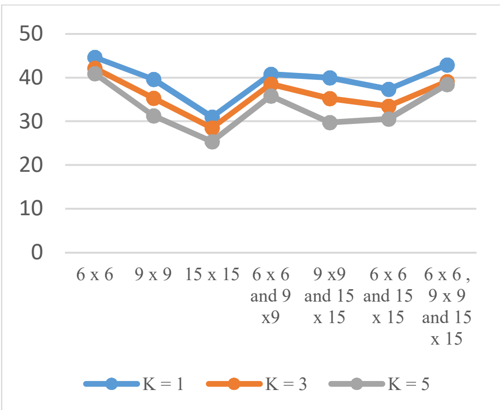

Figure 11: the Similarity measurement results with some kinds of windows

In Figure 11, illustrates the first experiment with some types of windows, for the value of k = 1 has the highest percentage similarity compared to the values of k = 3 and 5. For that then the next experiment will only use the value k = 1. In addition, by looking at the table above merging 3 windows 6x6, 9 x9 and 15 x 15 for k = 1 had produced accuracy percentage of 42.9 percent, while for k = 2 the percentage of accuracy is 39.1 percent. By looking at the above percentage although the percentage is still below 50 percent but by looking at the available training data which is only 180 images but has been able to measure the similarity of test data up to 10.800 images even though the percentage of similarities using merging 3 windows is still less than 45 percent

B. The Second experiment on the image of batik with a size of 200 x 200 pixels which will be divided into 2 parts, namely the left and right images with a size of 90 x 90 pixels with 2 overlap that is 30 and 50 Pixel.
   a) The Collection of Training Data as many 540 images:
   b) Rotation with multiple angles consists of= [0 10 110];
   c) Image scale used= [1];
   d) The Collection of Testing Data as many 10800 images Rotation with multiple angles consists of = [15 30 45 60 75 90 105 120 135 150 165 180];
   e) Image scale used= [0.9 1.2 1.4 1.6 1.8];
   f) The type of classification approach used is K-NN.
   g) For Using Single window the result of Experiment is

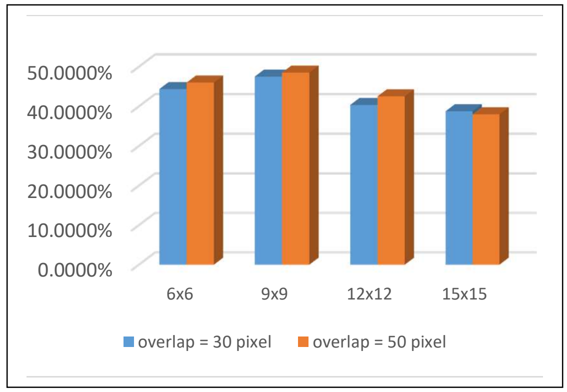

Figure 12 : The Similarity measurement results with Single windows and the amount of trainig data = 540 images and testing data = 10.800 images

In Figure 12, illustrates the second experiment, the training data was added to 540 images, with 3 conditions added to the image, which experienced a number of rotations of 0, 10 and 110 degrees. While for the test data as many as 10,800 images. By using 1 (single) window with overlap of 30 and 50 pixels, the percentage of measurement of the highest similarity is 48.5 percent with overlap of 50 pixels, not much different from the overlap of 30 pixels which is 47.5 percent. For experiments using type of windows, the results of the study are in Figure 13

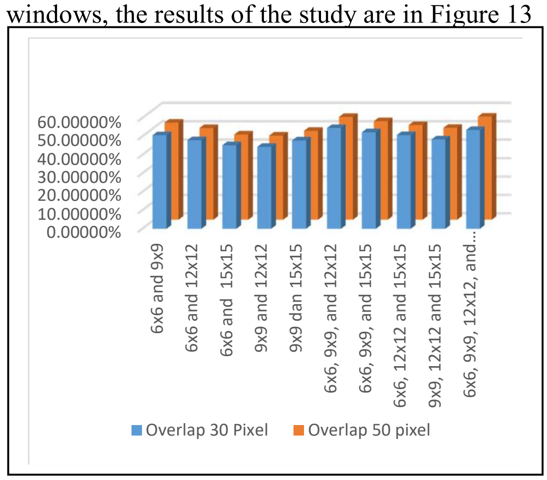

Figure 13 : The Similarity measurement results using M2ECS – LBP with and the amount of training data = 540 images and testing data = 10.800 image.

Figure 13 illustrates the results of the experiments utilized some type of windows then for overlapping 50 pixels it has better features than overlapping 30 pixels, although the average difference is less than 1 percent. For this experiment, the highest accuracy is with type of windows 6x6, 9x9 and 12x12 with accuracy is 55,7%. In this study can be concluded also that with the addition a lot of windows (4 windows), but for the highest results with 50 pixel overlap 54,9%, it's no better just using 3 windows. This research will be continued by adding a number of training images with certain conditions.

C. The third experiment with the same size of 90 x 90 pixels with 2 overlap that is 30 and 50 Pixel.

a. The Collection of Training Data as many 1080 images:
b. Rotation with multiple angles consists of= [0 10 110]; Image scale used= [1 ,1.5];
c. The Collection of Testing Data as many 10800 images
d. Rotation with multiple angles consists of= [15 30 45 60 75 90 105 120 135 150 165 180];
e. Image Scale used = [0.9, 1.2, 1.4, 1.6, 1.8]
f. The type of classification approach used is K-NN.
g. For Using Single window the result of Experiment is

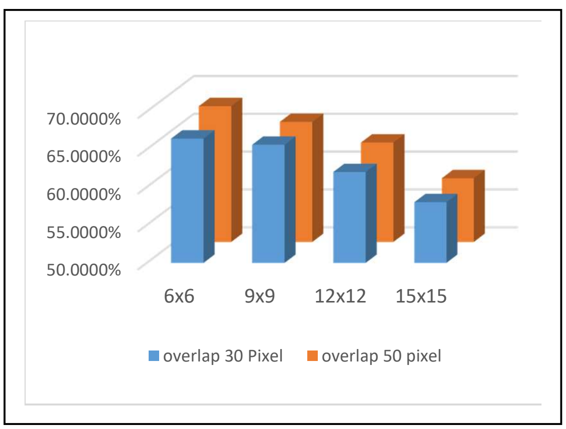

Figure 14 : The Similarity measurement results using M2ECS – LBP with the amount of training data = 1080 images and testing data = 10.800 image.

Figure 14 illustrates the third experiment, which is 1320 images for training data, with addition to 3 (three) conditions in the image that experience a number of rotations of 0, 10 and 110 degrees, including several scales of 100 and 150 percent. The test data was reduced to as many as 21,780 images. By using 1 (single) window with overlap of 30 and 50 pixels, the percentage of measurement of the highest similarity is 67.9 percent with overlap of 50 pixels, not much different from the overlap of 30 pixels which is 66.4 percent.

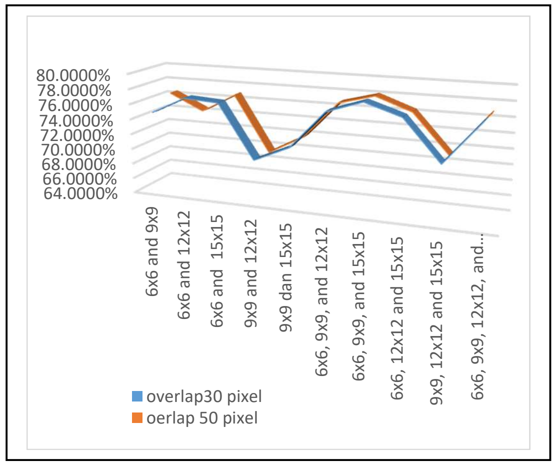

Figure 15 : The Similarity measurement results using M2ECS – LBP with the amount of training data = 1080 images and testing data = 10800 image.

Figure 15 illustrates this experiment where the highest accuracy with type of windows 6x6, 9x9 and 15x12. Accuracy percentage is 78,2% with overlap 30 pixel and the result no so different with the same type of windows with overlap 50 pixel with accuracy percentage 78,0556 %. In this study it can be concluded also that with the addition of similarity evaluation even though it utilized a lot of windows (4 windows), 6x6, 9x9, 12x12, and 15x15 but for the highest results with 30 pixel overlap with percentage only 77,2%, it's no better just using 3 windows. This research would be continued by adding a number of training images with certain conditions.

In the fourth and fifth experiments, we added batik patterns to 12 classes (batik patterns). For each class there are 10 batik images. Thus the total image becomes 120 batik images.

D. The fourth experiment with the same size of 90 x 90 pixels with 2 overlap that is 30 and 50 Pixel.

a. The Collection of Training Data as many 13.440 images:

b. Rotation with multiple angles consists of [0,15,30,45,60,90,120]; Image scale used [0.9 1 1.1 1.2 1.3 1.4 1.5 2.0].
c. The Collection of Testing Data as many 8400 images
d. Rotation with multiple angles consists of [0,15,30,45,60,90,120]; Image Scale used [0.8 1.6 1.7 1.8 1.9].
e. Type of classification approach used is K-NN.

Table 1: Results of the 4th experiment with different scales and the same rotation

No.	Some kind of windows	Percentage of accuracy with Overlap 30 pixel	Percentage of accuracy with Overlap 50 pixel
1	6x6 and 9x9	96.31%	96.73%
2	6x6 and 12x12	97.60%	97.89%
3	6x6 and 15x15	97.90%	98.13%
4	9x9 and 12x12	94.17%	95.04%
5	9x9 and 15x15	96.10%	96.92%
6	12x12 and 15x15	92.05%	90.77%
7	6x6, 9x9, and 12x12	98.44%	98.56%
8	6x6, 9x9, and 15x15	98.94%	99.36%
9	6x6, 12x12, and 15x15	98.54%	**98.89%**
10	9x9, 12x12, and 15x15	71.57%	**97.48%**
11	6x6, 9x9, 12x12, and 15x15	98.99%	**99.30%**

Table 1.0 illustrates that the results of this study indicate the accuracy of similarities to reach more than 99 percent due to several things including
a. This study uses a different image scale, but the same image rotation for training image data and test image data.
b. The amount of training image data is more than the test image.

Based on the experimental results it shows the highest accuracy using multi windows 6x6, 9x9, and 15x15 to reach 99.36% with images overlapping 50 pixels. The other highest accuracy is using multi window 6x6, 9x9, 12x12, and 15x15 with with images overlapping 50 pixel images, namely 99.30. This study shows one of the advantages shown in the M2ECS-LBP algorithm for feature extraction processes.

E. The fifth experiment with the size of 90 x 90 pixels with 2 overlap that is 30 and 50 Pixel. The condition of experiment as follows:
a) The Collection of Training Data as many 13.440 images:
b) Rotation with multiple angles consists of= [0,15,30 ,45,60,90,120]; Image scale used= [0.9,1.0,1.1,1.2,1.3,1.4,1.5,2.0;
c) The Collection of Testing Data as many 4800 images
d) Rotation with multiple angles consists of= [135,150,165,180]; Image Scale used = [0.8,1.6,1.7,1.8,1.9]
e) The type of classification approach used is K-NN.

Table 2: Results of the 5th experiment with different scales and the different rotation

No.	Some kind of windows	Percentage of accuracy with Overlap 30 pixel	Percentage of accuracy with Overlap 50 pixel
1	6x6 and 9x9	73.83%	75.50%
2	6x6 and 12x12	77.00%	79.35%
3	6x6 and 15x15	78.56%	80.67%
4	9x9 and 12x12	66.92%	69.90%
5	9x9 and 15x15	71.12%	72.96%
6	12x12 and 15x15	60.44%	61.94%
7	6x6, 9x9, and 12x12	77.33%	79.38%
8	6x6, 9x9, and 15x15	80.02%	81.52%
9	6x6, 12x12 and 15x15	79.44%	81.60%
10	9x9, 12x12 and 15x15	79.44%	72.48%
11	6x6, 9x9, 12x12 and 15x15	79.33%	81.73%

Table 2 illustrates the result of fifth experiment, there are some changing of number of training images was 13,440 images, which were more than the test images of 4,800 images. Based on this experiment, the highest percentage of accuracy is in 3 types of windows, namely type of windows 6x6, 9 x 9 and 15 x 15 with accuracy is 81.5 %, type of windows 6x6, 12 x 12 and 15 x 15 with accuracy

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is 81.6 % and type of windows 6x6, 9x9, 12x12, and 15x15 with accuracy is 81.73 %, with 50 pixel overlap.

4. CONCLUTION

In this paper, we proposed a novel method for feature description based on local pattern analysis. There are some information after doing this research, they are :

A. This research has been able to answer and resolve problems in recognizing and identifying batik images that undergo changes in rotation and scale simultaneously.

B. There are windows combinations to achieve optimal accuracy in classifications such as merging from the results of image feature extraction using 2 windows, 3 windows and 4 windows.

C. The first experiment was using k = 1, we got the optimal result if we utilize type of window 6x6, 9x9 and 15 x 15 with result is 42,9 % for overlap 30 pixel. This research utilized the K-NN for classification than for the value of K = 1.

D. The second experiment we get the optimal result if we use combination window for 6x6, 9x9 and 12 x 12 with result is 55,7% for overlap 50 pixel.

E. The third experiment we get the optimal result if we use combination window for 6x6, 9x9 and 15 x 15 with result is 78,2% % in overlap 30 pixel.

F. In this study, M2ECS-LBP Algorithm has been shown to be very reliable for image feature extraction in supporting classification, because the percentage accuracy of classification can reach more than 99 percent for image conditions that undergo scale changes but rotational same. This can be seen in the results of the fourth study, for types of windows 6x6, 9x9, and 15x15 and types of windows 6x6, 9x9, 12x12, and 15x15 can reach up to 99.3 percent.

G. In the fifth experiment where the number of test data is less than the training data so that the percentage of accuracy of the classification reaches above 81.6 percent, for types of windows 6x6, 12x12 and 15x15 including types of windows 6x6, 9x9, 12x12 and 15x15 with overlap 50 pixel .

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